US008239288B2

(12) **United States Patent**
Asikainen

(10) **Patent No.: US 8,239,288 B2**
(45) **Date of Patent: Aug. 7, 2012**

(54) **METHOD, MEDIUM, AND SYSTEM FOR PROVIDING A RECOMMENDATION OF A MEDIA ITEM**

(75) Inventor: **Joonas Asikainen**, Zurich (CH)

(73) Assignee: **Rovi Technologies Corporation**, Santa Clara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 205 days.

(21) Appl. No.: **12/776,924**

(22) Filed: **May 10, 2010**

(65) **Prior Publication Data**

US 2011/0276512 A1 Nov. 10, 2011

(51) **Int. Cl.**
G06Q 30/00 (2006.01)

(52) **U.S. Cl.** **705/26.7**

(58) **Field of Classification Search** 705/26.7, 705/347, 26.1; 707/723
See application file for complete search history.

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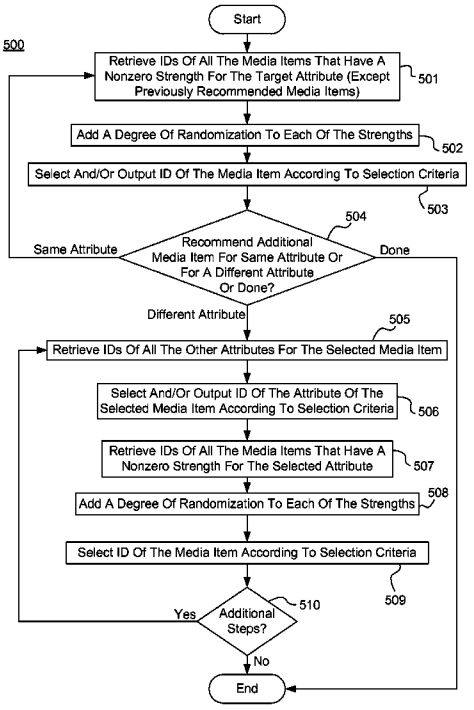
Primary Examiner — Matthew Zimmerman
(74) *Attorney, Agent, or Firm* — Fitzpatrick, Cella, Harper & Scinto

(57) **ABSTRACT**

A processor retrieves, from a database, an identifier of a first media item rated by a target user, user identifiers of users having provided media item ratings for the first media item, and the media item ratings provided by the users, correspondingly. Each of the media item ratings is randomized, resulting in randomized media item ratings. A user identifier corresponding to a maximum of the randomized media item ratings is selected from the user identifiers. Additional media item ratings associated with the selected user identifier are retrieved from the database. Each of the additional media item ratings are randomized, resulting in additional randomized media item ratings. An identifier of a recommended media item corresponding to a maximum of the randomized media item ratings and the additional randomized media item ratings is selected. Metadata associated with the recommended media item is transmitted to a user device over a network.

12 Claims, 6 Drawing Sheets



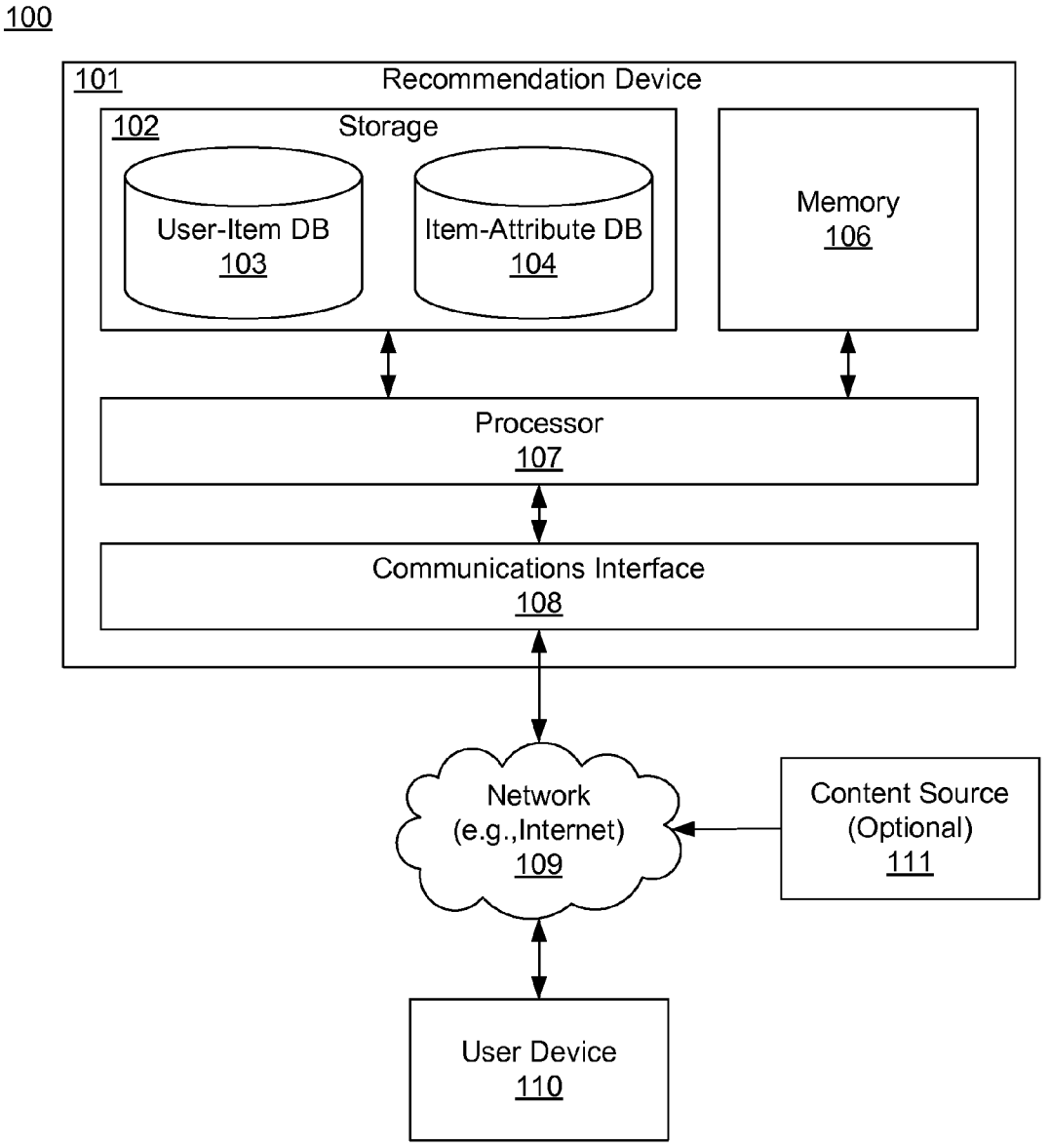

100
101
Recommendation Device
102
Storage
User-Item DB
103
Item-Attribute DB
104
Memory
106
Processor
107
Communications Interface
108
Network
(e.g.,Internet)
109
Content Source
(Optional)
111
User Device
110

FIG. 1

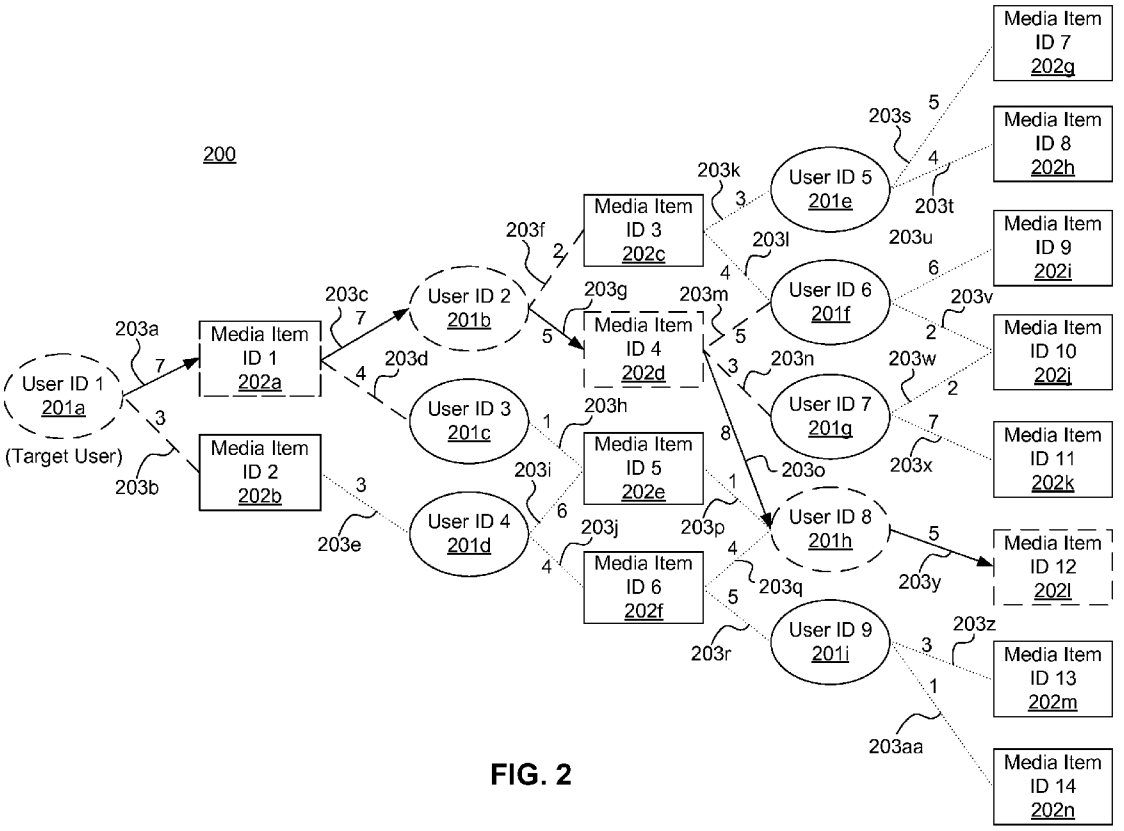

200
User ID 1
201a
(Target User)
203a
7
203b
3
Media Item
ID 1
202a
Media Item
ID 2
202b
203c
7
203d
4
203e
3
User ID 2
201b
User ID 3
201c
User ID 4
201d
203f
2
203g
5
203h
1
203i
6
203j
4
Media Item
ID 3
202c
Media Item
ID 4
202d
Media Item
ID 5
202e
Media Item
ID 6
202f
203k
3
203l
4
203m
5
203n
3
203o
8
203p
1
203q
4
203r
5
User ID 5
201e
User ID 6
201f
User ID 7
201g
User ID 8
201h
User ID 9
201i
203s
5
4
203t
203u
6
203v
2
203w
2
7
203x
5
203y
3
203z
1
203aa
Media Item
ID 7
202g
Media Item
ID 8
202h
Media Item
ID 9
202i
Media Item
ID 10
202j
Media Item
ID 11
202k
Media Item
ID 12
202l
Media Item
ID 13
202m
Media Item
ID 14
202n

FIG. 2

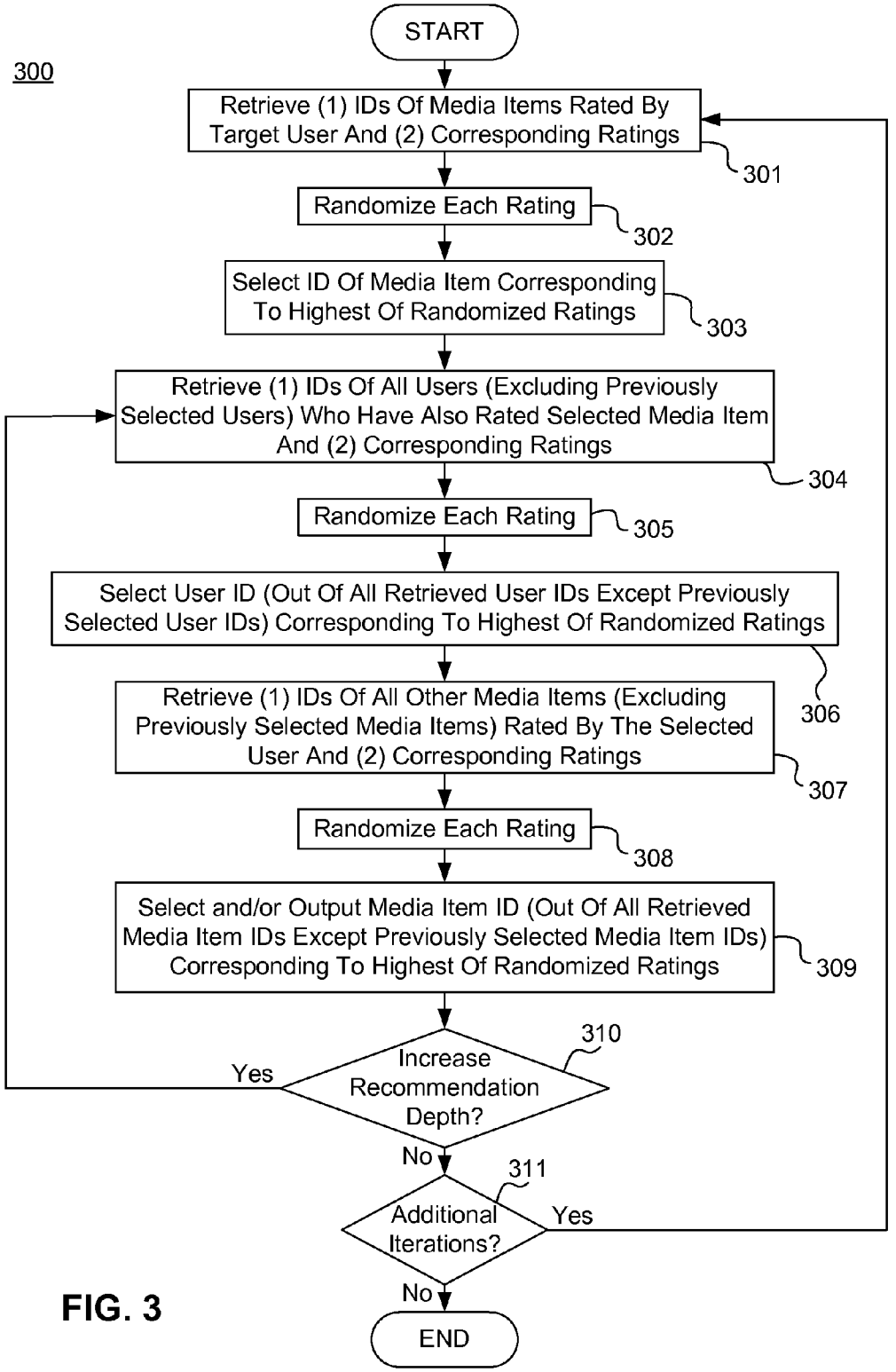

300
START
Retrieve (1) IDs Of Media Items Rated By Target User And (2) Corresponding Ratings
301
Randomize Each Rating
302
Select ID Of Media Item Corresponding To Highest Of Randomized Ratings
303
Retrieve (1) IDs Of All Users (Excluding Previously Selected Users) Who Have Also Rated Selected Media Item And (2) Corresponding Ratings
304
Randomize Each Rating
305
Select User ID (Out Of All Retrieved User IDs Except Previously Selected User IDs) Corresponding To Highest Of Randomized Ratings
306
Retrieve (1) IDs Of All Other Media Items (Excluding Previously Selected Media Items) Rated By The Selected User And (2) Corresponding Ratings
307
Randomize Each Rating
308
Select and/or Output Media Item ID (Out Of All Retrieved Media Item IDs Except Previously Selected Media Item IDs) Corresponding To Highest Of Randomized Ratings
309
310
Increase Recommendation Depth?
Yes
No
311
Additional Iterations?
Yes
No
END

FIG. 3

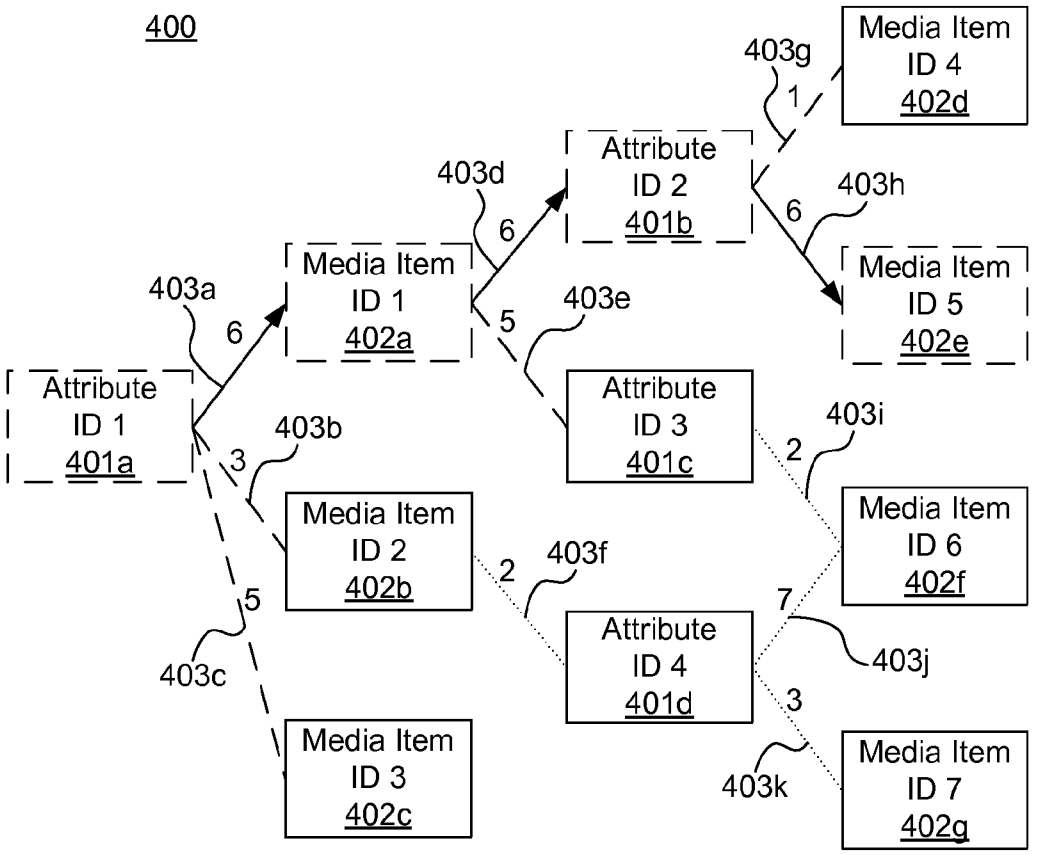

400
Attribute ID 1 401a
403a
6
Media Item ID 1 402a
403b
3
Media Item ID 2 402b
5
403c
Media Item ID 3 402c
403d
6
Attribute ID 2 401b
403g
1
Media Item ID 4 402d
403h
6
Media Item ID 5 402e
403e
5
Attribute ID 3 401c
403i
2
Media Item ID 6 402f
2
403f
Attribute ID 4 401d
7
403j
3
403k
Media Item ID 7 402g

FIG. 4

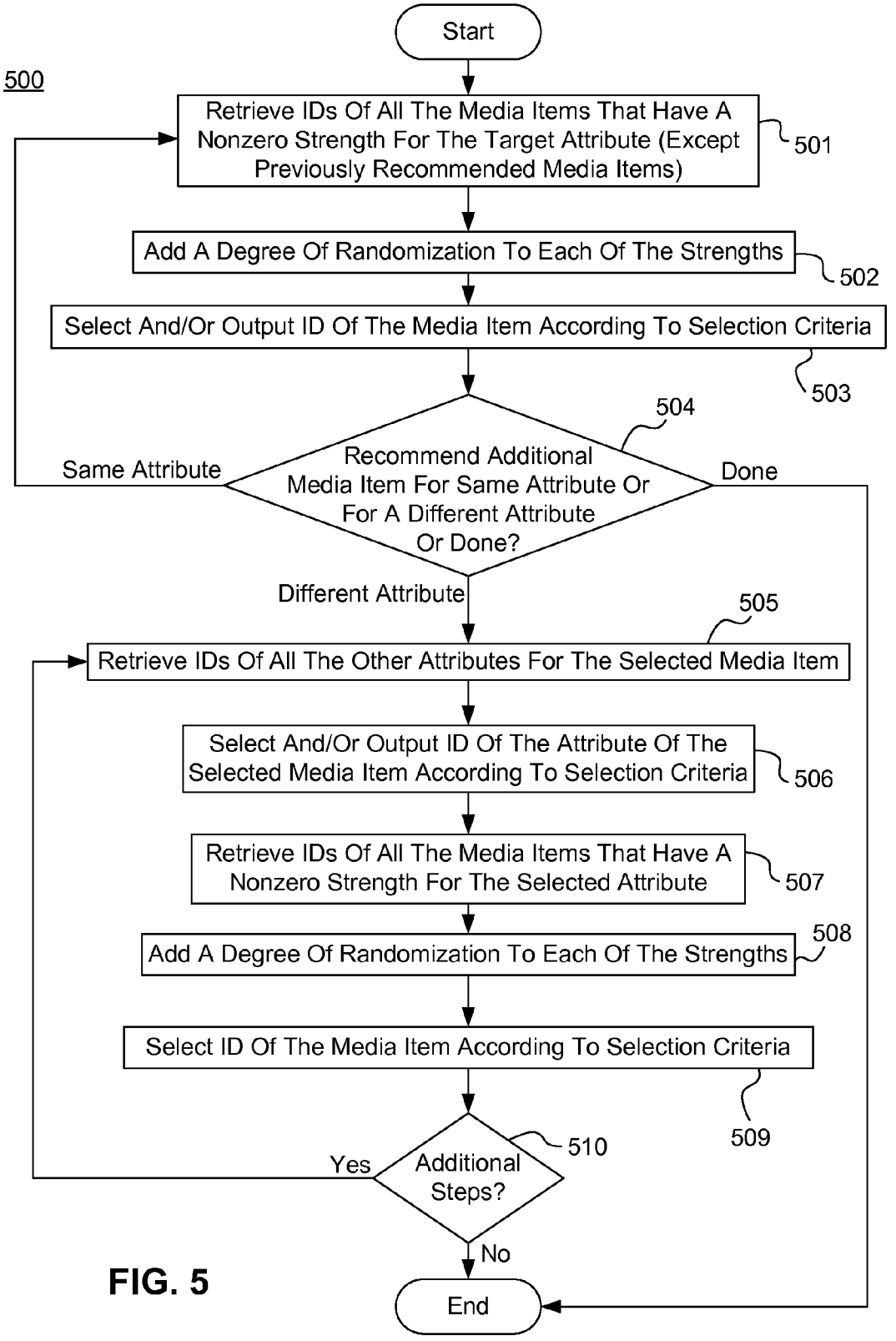

Start
500
Retrieve IDs Of All The Media Items That Have A Nonzero Strength For The Target Attribute (Except Previously Recommended Media Items)
501
Add A Degree Of Randomization To Each Of The Strengths
502
Select And/Or Output ID Of The Media Item According To Selection Criteria
503
504
Recommend Additional Media Item For Same Attribute Or For A Different Attribute Or Done?
Same Attribute
Done
Different Attribute
505
Retrieve IDs Of All The Other Attributes For The Selected Media Item
Select And/Or Output ID Of The Attribute Of The Selected Media Item According To Selection Criteria
506
Retrieve IDs Of All The Media Items That Have A Nonzero Strength For The Selected Attribute
507
508
Add A Degree Of Randomization To Each Of The Strengths
Select ID Of The Media Item According To Selection Criteria
509
510
Additional Steps?
Yes
No
End

FIG. 5

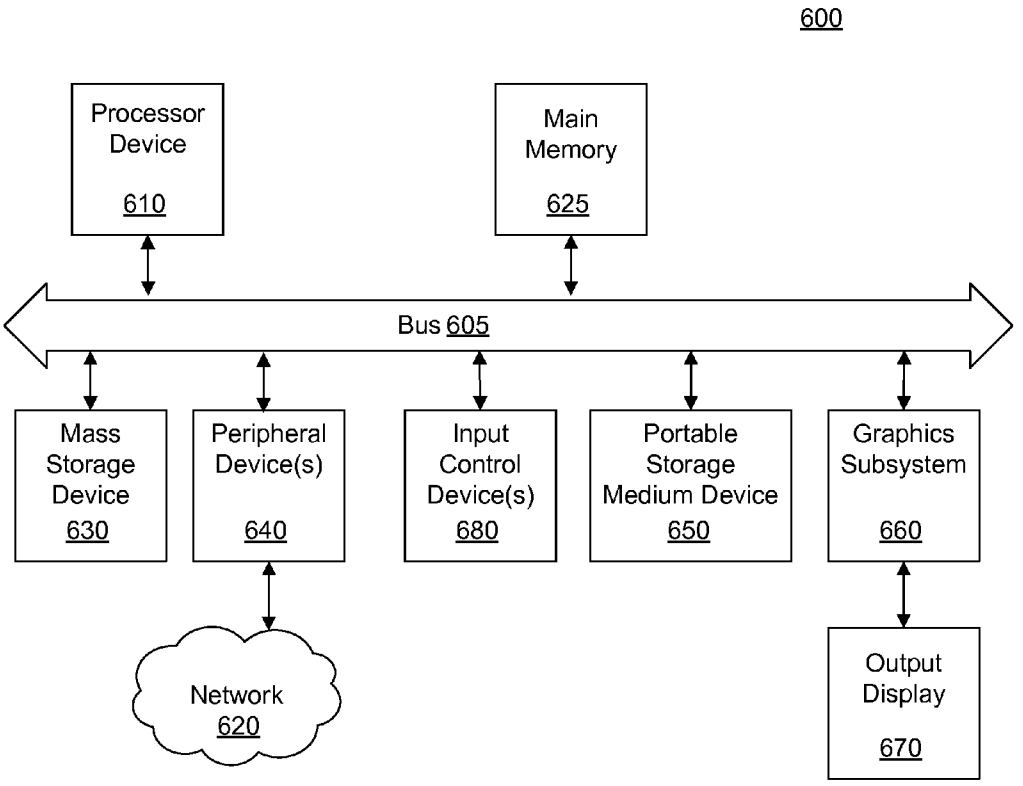

600
Processor Device 610
Main Memory 625
Bus 605
Mass Storage Device 630
Peripheral Device(s) 640
Input Control Device(s) 680
Portable Storage Medium Device 650
Graphics Subsystem 660
Network 620
Output Display 670

FIG. 6

METHOD, MEDIUM, AND SYSTEM FOR PROVIDING A RECOMMENDATION OF A MEDIA ITEM

BACKGROUND

1. Field

Example aspects of the present invention generally relate to media item recommendations, and more particularly to systems, methods, and computer program products for providing a recommendation of a media item.

2. Related Art

The digitization of music, movies, and games, as well as the improvement in electronic delivery techniques, have changed the way consumers experience such media content. Consumers can download digital music, movies, or games via the Internet with the click of a mouse, and can enjoy them at their convenience. Consumers can also have media content streamed from a Web site to a consumer device, such as a computer, a television, or portable device, upon demand.

In addition, the variety of media content available to consumers today is wider than ever. Consumers can browse vast collections of music, movies, and games via Internet or television browsers to identify a particular media item to download or stream. Locating desired media items within these collections, however, can be difficult given their enormity.

To avoid the need for consumers to browse these vast collections, content providers provide consumers with recommendations of media items. Recommending media items to consumers promotes the discovery of new media items and increases consumer satisfaction with the content provider.

One conventional approach to providing consumers with recommendations of media items has been to compute an explicit numerical similarity for each pair of media items based on underlying media item attributes. Media items are then recommended based on the computed similarities. This approach, however, requires substantial computing resources and is inefficient for vast collections of media items.

BRIEF DESCRIPTION

Given the foregoing, it would be useful to have an efficient system for providing recommendations of media items.

The example embodiments described herein meet the above-identified needs by providing systems, methods, and computer program products for providing a recommendation of a media item. The system includes a processor that retrieves, from a database, an identifier of a first media item rated by a target user, user identifiers of users having provided media item ratings for the first media item, and the media item ratings provided by the users, correspondingly. Each of the media item ratings is randomized, resulting in randomized media item ratings. A user identifier corresponding to a maximum of the randomized media item ratings is selected from the user identifiers. Additional media item ratings associated with the selected user identifier are retrieved from the database. Each of the additional media item ratings are randomized, resulting in additional randomized media item ratings. An identifier of a recommended media item corresponding to a maximum of the randomized media item ratings and the additional randomized media item ratings is selected. Metadata associated with the recommended media item is transmitted to a user device over a network.

In another aspect, the processor identifies a plurality of media item recommendations for the target user, and computes frequencies of occurrence for each identified media item recommendation, and transmits, to the user device over the network, a media item recommendation corresponding to a maximum of the frequencies of occurrence.

In yet another aspect, randomizing media item ratings includes at least one of adding degrees of randomization to the media item ratings, subtracting degrees of randomization from the media item ratings, multiplying degrees of randomization by the media item ratings, and dividing degrees of randomization by the media item ratings, correspondingly, wherein the degrees of randomization include at least one of an integer and a real-valued number.

Further features and advantages, as well as the structure and operation, of various example embodiments of the present invention are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the example embodiments presented herein will become more apparent from the detailed description set forth below when taken in conjunction with the drawings.

FIG. **1** is a system diagram of an exemplary media item recommendation system in which some embodiments are implemented.

FIG. **2** is a user-item diagram illustrating information stored in a user-item database.

FIG. **3** is a flowchart diagram illustrating an exemplary procedure for providing a media item recommendation by using a network of users and media items.

FIG. **4** is an item-attribute diagram illustrating information stored in an item-attribute database.

FIG. **5** is a flowchart diagram illustrating an exemplary procedure for providing a media item recommendation by using a network of media items and media item attributes.

FIG. **6** is a block diagram of a general and/or special purpose computer system, in accordance with some embodiments.

DETAILED DESCRIPTION

I. Definitions

Some terms are defined below in alphabetical order for easy reference. These terms are not rigidly restricted to these definitions. A term may be further defined by its use in other sections of this description.

"Database" means a collection of data organized in such a way that a computer program may quickly select desired pieces of the data. A database is an electronic filing system. In some implementations, the term "database" may be used as shorthand for "database management system".

"Degree of randomization" generally means a numerical value indicating an extent to which an original numerical value (e.g., a media item rating, a media item attribute strength, etc.) has been randomized. Randomization is described in further detail below.

"Device" means software, hardware, or a combination thereof. A device may sometimes be referred to as an apparatus. Examples of a device include without limitation a software application such as Microsoft Word™, a laptop computer, a database, a server, a display, a computer mouse, and a hard disk. Each device is configured to carry out one or more steps of the method of storing an internal identifier in metadata.

"Link" means an association between two or more objects or elements in memory. A link can be, for example, a pointer or a variable that contains the address of a location in memory,

where the location is the starting point of an allocated object or the element of an array. The memory may be located on a database or a database system. "Linking" means associating (e.g., by pointing to) objects in memory.

"Media item" means any item of media content, such as a song, a movie, a game, a television show, and music or videos of various types. A media item can be recorded in many different formats, and may have many different versions.

"Media item attribute" means any characteristic of a media item. Each media item attribute corresponds to a particular media item attribute category.

"Media item attribute category" means a grouping of related media item attributes. Example media item attribute categories and media item attributes for music include cognitive attributes (e.g., simplicity, storytelling quality, melodic emphasis, vocal emphasis, speech like quality, strong beat, good groove, fast pace), emotional attributes (e.g., intensity, upbeatness, aggressiveness, relaxing, mellowness, sadness, romance, broken heart), aesthetic attributes (e.g., smooth vocals, soulful vocals, high vocals, sexy vocals, powerful vocals, great vocals), social behavioral attributes (e.g., easy listening, wild dance party, slow dancing, workout, shopping mall), genre attributes (e.g., alternative, blues, country, electronic/dance, folk, gospel, jazz, Latin, new age, R&B/soul, rap/hip hop, reggae, rock), sub-genre attributes (e.g., blues, gospel, motown, stax/memphis, philly, doo-wop, funk, disco, old school, blue-eyed soul, adult contemporary, quiet storm, crossover, dance/techno, electro/synth, new jack swing, retro/alternative, hip hop, rap), instrumental/vocal attributes (e.g., instrumental, vocal, female vocalist, male vocalist), backup vocal attributes (e.g., female vocalist, male vocalist), instrument attributes (e.g., most important instrument, second most important instrument), etc.

Examples of media item attribute categories and attributes for movies include genre (e.g., action, animation, children and family, classics, comedy, documentary, drama, faith and spirituality, foreign, high definition, horror, independent, musicals, romance, science fiction, television, thrillers), release date (e.g., within past six months, within past year, 1980s), etc.

Other media item attribute categories and media item attributes are contemplated and are within the scope of the embodiments described herein.

"Media item attribute strength" means a numerical value assigned to a media item to indicate the degree to which the media item is characterized by a particular media item attribute. Media item attribute strengths may be integers, real-valued numbers, and/or the like. Example media item attribute strengths include strengths from one (the media item is not characterized by the media item attribute at all) to five (the media item is characterized by the media item attribute very much).

"Media item rating" means a numerical value indicating the degree to which a user enjoys a particular media item. Media item ratings may be explicitly assigned by a user to a media item. For example, users can rate media items on a scale from one (the user did not enjoy the media item at all) to five (the user enjoyed the media item very much). Media item ratings may also be implicitly computed by aggregating the interaction of a user with media items on a Web site. For example, the fact that a user selected to skip playback of a particular media item may be used to compute a low media item rating for that media item.

"Metadata" generally means data that describes data. More particularly, metadata may be used to describe the contents of digital recordings. Such metadata may include, for example, a track name, a song name, artist information (e.g., name, birth date, discography), album information (e.g., album title, review, track listing, sound samples), relational information (e.g., similar artists and albums, genre) and/or other types of supplemental information such as advertisements, links or programs (e.g., software applications), and related images. Metadata may also include a program guide listing of the songs or other audio content associated with multimedia content. Conventional optical discs (e.g., CDs, DVDs, Blu-ray Discs) do not typically contain metadata. Metadata may be associated with a digital recording (e.g., song, album, movie, or video) after the digital recording has been ripped from an optical disc, converted to another digital audio format and stored on a hard drive.

"Network" means a connection between any two or more computers, which permits the transmission of data. A network may be any combination of networks, including without limitation the Internet, a local area network, a wide area network, a wireless network, and a cellular network.

"Randomization" generally means a procedure of randomly modifying an original numerical value, such as a media item rating, a media item attribute strength, and the like, resulting in a randomized numerical value. An example randomization procedure includes adding a degree of randomization, such as a number randomly selected from a finite range of numbers, to an original numerical value. Other example randomization procedures include performing other arithmetical calculations, such as subtraction, multiplication, or division, on random numbers and original numerical values. Randomization is described in further detail below.

"Server" means a software application that provides services to other computer programs (and their users), in the same or another computer. A server may also refer to the physical computer that has been set aside to run a specific server application. For example, when the software Apache HTTP Server is used as the Web server for a company's Web site, the computer running Apache is also called the Web server. Server applications can be divided among server computers over an extreme range, depending upon the workload.

"Software" means a computer program that is written in a programming language that may be used by one of ordinary skill in the art. The programming language chosen should be compatible with the computer on which the software application is to be executed and, in particular, with the operating system of that computer. Examples of suitable programming languages include without limitation Object, Pascal, C, C++ and Java. Further, the functions of some embodiments, when described as a series of steps for a method, could be implemented as a series of software instructions for being operated by a processor, such that the embodiments could be implemented as software, hardware, or a combination thereof. Computer-readable media are discussed in more detail in a separate section below.

"Song" means a musical composition. A song is typically recorded onto a track by a record label (e.g., recording company). A song may have many different versions, for example, a radio version and an extended version.

"System" means a device or multiple coupled devices. A device is defined above.

"User" means a consumer, client, and/or client device in a marketplace of products and/or services.

"User device" (e.g., a client, a client device, a user computer) is a hardware system, a software operating system and/or one or more software application programs. A user device may refer to a single computer or to a network of interacting computers. A user device may be the client part of a client-server architecture. A user device typically relies on a server to perform some operations. Examples of a user device

include without limitation a television, a CD player, a DVD player, a Blu-ray Disc player, a personal media device, a portable media player, an iPod™, a Zoom Player, a laptop computer, a palmtop computer, a smart phone, a cell phone, a mobile phone, an MP3 player, a digital audio recorder, a digital video recorder, an IBM-type personal computer (PC) having an operating system such as Microsoft Windows™, an Apple™ computer having an operating system such as MAC-OS, hardware having a JAVA-OS operating system, and a Sun Microsystems Workstation having a UNIX operating system.

"Web browser" means any software program which can display text, graphics, or both, from Web pages on Web sites. Examples of a Web browser include without limitation Mozilla Firefox™ and Microsoft Internet Explorer™

"Web page" means any documents written in mark-up language including without limitation HTML (hypertext mark-up language) or VRML (virtual reality modeling language), dynamic HTML, XML (extended mark-up language) or related computer languages thereof, as well as to any collection of such documents reachable through one specific Internet address or at one specific Web site, or any document obtainable through a particular URL (Uniform Resource Locator).

"Web server" refers to a computer or other electronic device which is capable of serving at least one Web page to a Web browser. An example of a Web server is a Yahoo™ Web server.

"Web site" means at least one Web page, and more commonly a plurality of Web pages, virtually coupled to form a coherent group.

II. Overview

Systems, methods, apparatus and computer-readable media are provided for recommending a media item. In one aspect, a processor retrieves, from a database, an identifier of a first media item rated by a target user, user identifiers of users having provided media item ratings for the first media item, and the media item ratings provided by the users, correspondingly. Each of the media item ratings is randomized, resulting in randomized media item ratings. A user identifier corresponding to a maximum of the randomized media item ratings is selected from the user identifiers. Additional media item ratings associated with the selected user identifier are retrieved from the database. Each of the additional media item ratings are randomized, resulting in additional randomized media item ratings. An identifier of a recommended media item corresponding to a maximum of the randomized media item ratings and the additional randomized media item ratings is selected. Metadata associated with the recommended media item is transmitted to a user device over a network.

In another aspect, the processor identifies a plurality of media item recommendations for the target user, and computes frequencies of occurrence for each identified media item recommendation, and transmits, to the user device over the network, a media item recommendation corresponding to a maximum of the frequencies of occurrence.

In yet another aspect, randomizing media item ratings includes at least one of adding degrees of randomization to the media item ratings, subtracting degrees of randomization from the media item ratings, multiplying degrees of randomization by the media item ratings, and dividing degrees of randomization by the media item ratings, correspondingly, wherein the degrees of randomization include at least one of an integer and a real-valued number.

Exemplary aspects and embodiments are now described in more detail herein in terms of a recommendation device that executes program code to identify media item recommendations and provide the media item recommendations to a user device over a network. This is for convenience only and is not intended to limit the application of the present description. In fact, after reading the following description, it will be apparent to one skilled in the relevant art(s) how to implement the following invention in alternative embodiments such as, for example, by using a recommendation device that is incorporated within a content source to audibly and/or visibly reproduce a recommended media item for a user.

III. System Architecture

FIG. **1** is a system diagram of an exemplary media item recommendation system **100** in which some embodiments are implemented. The system **100** includes a recommendation device **101**, a network **109**, a user device **110**, and, optionally, a content source **111**.

The recommendation device **101** includes a processor **107**, which is communicatively coupled through a communication infrastructure (not shown) to a communications interface **108**, a memory **106**, and a storage device **102**. In general, the recommendation device **101** provides the user device **110** with recommendations of media items over the network **109**. As described in further detail below with respect to FIGS. **3** and **5**, the processor **107** executes instructions to identify a media item identifier stored in the storage device **102** and recommend the corresponding media item to a user of the user device **110**. In some embodiments, the processor **107** uses the memory **106** as temporary storage during execution of the instructions.

The storage device **102** (also sometimes referred to as "secondary memory") includes a user-item database **103** and an item-attribute database **104**.

The user-item database **103** is a collection of data representing users, media items, and the associations or links between users and media items. In particular, the user-item database **103** stores user profiles, which include user identifiers, a list of media items rated by each user and the corresponding media item ratings. The information stored in the user-item database **103** can be represented as a user-item diagram, which is described in further detail below with respect to FIG. **2**.

Media item ratings, which are defined above, may be explicitly or implicitly determined. In an exemplary embodiment, media item ratings are selected by users from a scale, such as a scale from one (denoting that the user does not enjoy the media item at all) to five (denoting that the user enjoys the media item very much). Users input media item ratings into the user-item database **203** via the user device **110** over the network **109**. Alternatively, or in addition, the processor **107** retrieves media item ratings from a commercially available database of media item ratings and stores them in the user-item database **203**. In general, the processor **107** identifies a media item to recommend to a particular user by using data within the user-item database **103**, as described in further detail below in connection with FIGS. **2** and **3**.

The item-attribute database **104** is a collection of data representing media items, media item attributes, and the associations or links between media items and media item attributes. More particularly, the item-attribute database **104** includes media item profiles corresponding to a particular media item. Each media item profile associates a unique media item identifier with its media item attribute categories, media item attributes, and numerical media item attribute strengths assigned to each media item attribute. The information stored in the item-attribute database **104** can be repre-

sented by an item-attribute diagram, which is described in further detail below with respect to FIG. **4**. In general, the processor **107** uses the item-attribute database **104** to identify a media item to recommend to a user according to a particular media item attribute, as described in further detail below in connection with FIG. **5**.

The user-item database **103** and the item-attribute database **104** may be combined into a single database or divided into multiple distinct databases and still be within the scope of the embodiments described herein.

The storage device **102** may also include, for example, a hard disk drive and/or a removable storage drive, representing a disk drive, a magnetic tape drive, an optical disk drive, etc. As will be appreciated, the storage device **102** may include a computer-readable storage medium having stored thereon computer software and/or data.

In alternative embodiments, the storage device **102** may include other similar devices for allowing computer programs or other instructions to be loaded into the recommendation device **101**. Such devices may include, for example, a removable storage unit and an interface, a program cartridge and cartridge interface such as that found in video game devices, a removable memory chip such as an erasable programmable read only memory (EPROM), or programmable read only memory (PROM) and associated socket, and other removable storage units and interfaces, which allow software and data to be transferred from the removable storage unit to the recommendation device **101**.

The communications interface **108** provides the recommendation device **101** with connectivity to the network **109**, which may be a proprietary network, the Internet, or the like. In particular, the communications interface **108** enables the recommendation device **101** to communicate recommendations of media items to the user device **110** via the network **109**. The communications interface **108** also allows software and data to be transferred between the recommendation device **101** and external devices. Examples of the communications interface **108** may include a modem, a network interface such as an Ethernet card, a communications port, a Personal Computer Memory Card International Association (PCMCIA) slot and card, etc. Software and data transferred via the communications interface **108** are in the form of signals which may be electronic, electromagnetic, optical, or other signals capable of being received by the communications interface **108**. These signals are provided to and/or from the communications interface **108** via a communications path, such as a channel. This channel carries signals and may be implemented by using wire, cable, fiber optics, a telephone line, a cellular link, an RF link, and/or other suitable communications channels.

The user device **110** is a device having a user-interface through which recommendation of media items are presented to a user. Examples of the user device **110** include a personal computer, a laptop computer, a television, a portable media player, etc. A user also can interface with the user device **110** to request recommendations from the recommendation device **101**, input media item ratings over the network **109**, or interact with any components of the system **100**, etc.

In some embodiments, the user device **110** audibly and/or visibly reproduces media content for a user. In these embodiments, the media items recommended by the recommendation device **101** can be provided to the user device **110** by the content source **111**.

IV. Collaborative Filtering-Based Recommendations

A. Overview

In general, collaborative filtering is performed by evaluating media item ratings obtained from a group of reviewers and using the ratings to determine a media item to recommend to a target user. In particular, a user-item database is queried to identify media items having media item ratings input by other users with preferences similar to the preferences of the target user, as described in further detail below with respect to FIGS. **2** and **3**.

B. User-Item Database

FIG. **2** is a user-item diagram **200** illustrating information stored in a user-item database, such as the user-item database **103**. As described above with respect to FIG. **1**, the user-item database **103** includes user profiles for each user, with each user profile having a corresponding unique user identifier. An example of such a user profile is shown below in Table 1.

TABLE 1

User ID 1	Optional User Attribute(s)
Media Item ID 1	Media Item Rating 1
Media Item ID 2	Media Item Rating 2
Media Item ID 3	Media Item Rating 3

Each user profile associates a user identifier with media item identifiers of media items the corresponding user has rated, as well as numerical media item ratings the user has assigned to the rated media items. These associations are illustrated in the user-item diagram **200** by links that connect user identifiers **201***a*, **201***b*, **201***c*, **201***d*, **201***e*, **201***f*, **201**g, **201***h*, **201***i* (collectively **201**) to media item identifiers **202***a*, **202***b*, **202***c*, **202***d*, **202***e*, **202***f*, **202***g*, **202***h*, **202***i*, **202***j*, **202***k*, **202***l*, **202***m*, **202***n* (collectively **202**).

As described in further detail below with respect to FIG. **3**, the solid-lined links in the user-item diagram **200** represent links to media item identifiers and user identifiers selected by the processor **107** during the implementation of procedure **300**. The long-dashed links in the user-item diagram **200** represent links to media item identifiers and user identifiers retrieved, but not selected, by the processor **107** during the implementation of procedure **300**. The short-dashed links in the user-item diagram **200** represent links to media item identifiers and user identifiers that have not been retrieved by the processor **107** during the implementation of procedure **300**.

Adjacent to the links in the user-item diagram **200** are numbers that represent the media item ratings **203***a*, **203***b*, **203***c*, **203***d*, **203***e*, **203***f*, **203***g*, **203***h*, **203***i*, **203***j*, **203***k*, **203***l*, **203***m*, **203***n*, **203***o*, **203***p*, **203***q*, **203***r*, **203***s*, **203***t*, **203***u*, **203***v*, **20***w*, **203***x*, **203***y*, **203***z*, **203***aa* (collectively **203**). The media item ratings **203** illustrated in the user-item diagram **200** include degrees of randomization, which are described in further detail below.

C. Collaborate Filtering-Based Recommendation Process

FIG. **3** is a flowchart diagram illustrating an exemplary procedure **300** for providing a media item recommendation by using a user-item diagram, such as the user-item diagram **200**.

The user **201***a*, which is also sometimes referred to as a target user, is the user for which the recommendation device **101** provides a media item recommendation. Referring to FIGS. **1-3**, initially, at block **301**, the processor **107** retrieves a list of all the identifiers of media items **202***a* and **202***b* that have been rated by the target user **201***a* as well as the corresponding media item ratings **203***a* and **203***b* the target user **201***a* has assigned to each rated media item **202***a* and **202***b* (also sometimes collectively referred to as "target user preferences").

At block **302**, the processor **107** randomizes each media item rating by adding a degree of randomization, which, in an exemplary embodiment, is a number randomly selected from a finite range of numbers and added to the user-provided

media item ratings. An example finite range from which the random number is selected is a range from zero to fifty percent of the highest media item rating (e.g., from zero to two for a scale of one to five). The example media item ratings **203** shown in FIG. **2** are selected by users from a scale of one to five and include degrees of randomization (not shown) ranging from zero to two. Thus, the randomized media item ratings **203** of FIG. **2** range from one to seven.

Media item rating inaccuracies, which may sometimes be referred to as a margin of error, result from various factors such as mistaken or unintentional media item ratings, mood swings of users, the lack of granularity of the discrete rating scale, etc. In the case of media item ratings implicitly computed from user interactions with computer systems, the margin of error can be particularly large. The effects of media item rating inaccuracies are reduced by the randomization. In addition, because the procedure **300** proceeds on the path having the highest media item rating, randomizing the media item ratings ensures wider sampling over paths in the user-item diagram **200**, particularly paths having high media item ratings but slightly less than the highest possible media item rating. Randomization also enables the procedure **300** to encounter media items that do not have the highest media item ratings, but which may nonetheless lead to other highly rated media items that provide good recommendations. Additionally, randomization promotes a wide variety of media item recommendations. Without randomization, media items which have not been rated very highly would rarely be recommended. With randomization, however, media items which have not been highly rated may become more likely to be recommended after a degree of randomization has been added. For example, if users rated media items on a discrete scale from one to five, most often only media items having ratings of five would be recommended. If those media items were randomized, however, some media items having ratings of three or four may become ratings of five after being randomized, thus increasing their chance of being recommended.

For illustrative purposes, randomization uses the same units as the ratings. Other types of rating factors, however, can be added to the ratings as well by using, for example, normalization or constant factors, which need not be linear.

At block **303**, the processor **107** selects, from the list of media items **202***a* and **202***b* rated by the target user **201***a*, an identifier of the media item **202***a* to which the target user **201***a* has assigned the highest (randomized) media item rating **203***a*, which is seven in this example. The processor **107** thus identifies a media item **202***a* that the target user **201***a* enjoys very much.

At block **304**, the processor **107** retrieves identifiers of all the users **201***b*, **201***c*, **201***d* (other than the identifier of the target user **201***a*) who also have rated the media item **202***a* that was selected at block **303**.

At block **305**, the processor **107** randomizes each of the media item ratings **203***c* and **203***d* that the users **201***b* and **201***c*, respectively, have assigned to the media item **202***a*. Randomization is described in further detail above with respect to block **302**. As described above, the media item ratings **203***c* and **203***d* depicted in FIG. **2**, which were selected by users **201***b* and **201***c* from a scale of one to five, have been randomized to a scale of one to seven.

At block **306**, the processor **107** selects, from a list of all user identifiers that have been retrieved thus far (other than any user identifier that has already been selected), an identifier of the user **201***b* corresponding to the highest randomized media item rating **203***c*, which is seven in this example. In this way, the processor **107** links the target user **201***a* with the user **201***b* having similar media item preferences, e.g., that has assigned a high media item rating to the media item **202***a*, which the target user **201***a* also has rated highly.

At block **307**, the processor **107** retrieves identifiers of all the other media items **202***c* and **202***d* that have been rated by the user **201***b* selected at block **306**, as well as the media item ratings **203***f* and **203***g* that user **201***b* has assigned to the media items **202***c* and **202***d*, respectively.

At block **308**, the processor **107** randomizes each media item rating **203***f* and **203***g*, as described in further detail above with respect to block **302**. As described above, the media item ratings **203***f* and **203***g* depicted in FIG. **2**, which were selected by user **201***b* from a scale of one to five, have been randomized to a scale of one to seven.

At block **309**, the processor **107** selects, from a list of media item identifiers that have been retrieved thus far (other than any media item identifiers that has already been selected), an identifier of the media item **202***d* corresponding to the highest randomized media item rating **203***g*, which is five in this example.

In another embodiment, at block **306**, the processor **107** selects, from a list of user identifiers retrieved at block **304**, an identifier of the user **201***b* corresponding to the highest randomized media item rating **203***c*. In addition, or alternatively, at block **309**, the processor **107** selects, from a list of media item identifiers retrieved at block **307**, an identifier of the media item **202***d* corresponding to the highest randomized media item rating **203***g*.

1. Recommendation Depth

Recommendation depth is the number of iterations of blocks **304**, **305**, **306**, **307**, **308**, **309** that are performed. The number of steps defines the depth of the process. The media item **202***d* represents an output corresponding to one iteration of blocks **304** through **309**, e.g., a recommendation depth of one. At block **310**, the processor **107** determines whether to step deeper into the user-item diagram **200** to recommend an additional media item **202**. With each additional increment of recommendation depth, an additional media item is potentially recommended to the target user **201***a*. The higher the recommendation depth, the higher the likelihood that media item(s) recommended to the target user **201***a* was previously unknown to the target user **201***a*. The recommendation depth thus affects the discoverability of new media items through recommendation.

In one embodiment, once a user **201** or media item **202** of the user-item diagram **200** has been selected by the processor **107** during a given iteration of procedure **300**, the processor **107** cannot select that user **201** or media item **202** until another iteration of procedure **300** is initiated. In this way, redundant recommendations are avoided.

If the processor **107** determines at block **310** not to step deeper into the user-item diagram **200**, then the processor **107** communicates a recommendation of the media item **202***d* to the target user **201***a* via the user device **110** over the network **109** and the procedure **300** ends. Alternatively, the processor **107** can communicate to the user device **110** recommendations of all the media items **202***c*, **202***d*, **202***e*, **202***f*, **202***g*, **202***h*, **202***i*, **202***j*, **202***k*, **202***l*, **202***m*, **202***n* encountered during procedure **300** (excluding the media items **202***a* and **202***b* rated by the target user **201***a*).

If the processor determines at block **310** to step deeper into the user-item diagram **200**, then the processor **107** presents a recommendation of the media item **202***d* to the target user **201***a* and then repeats the procedures at blocks **304** through **309** to recommend an additional media item to the target user **201***a*.

In one embodiment, the processor **107** repeatedly performs the procedures of blocks **304** through **309** and outputs a subset of the media items selected by the processor **107** across multiple performances of the procedure of block **309**. For example, the processor **107** performs the procedures of blocks **304** through **309** ten times resulting in ten potential media item recommendations, randomly recommends five out of the ten media items, and disregards the other five media items.

2. Additional Iterations

At block **311**, the processor **107** determines whether to perform additional iterations of the procedure **300** for the target user **201***a* to identify additional media item recommendations and/or to improve the accuracy of the recommendations. If the processor **107** determines at block **311** not to perform additional iterations of the procedure **300** for the target user **201***a* then the procedure **300** ends.

If the processor **107** determines at block **311** to perform additional iterations of the procedure **300** for the target user **201***a* then the processor **107** repeats the procedures of blocks **301**, **302**, **303**, **304**, **305**, **306**, **307**, **308**, **309**, **310**, **311** to identify additional potential media item recommendations.

In one embodiment, the processor **107** records in the memory **106** identifiers of the media items selected at block **309** across multiple iterations of the procedure **300** and then determines which of the media items corresponding to the recorded identifiers to recommend to the target user **201***a*. The processor **107** outputs to the user device **110** a recommendation of the media item **203** corresponding to the identifier recorded in the memory **106** that has the highest frequency of occurrences across the iterations.

In yet another embodiment, the processor **107** computes the average media item rating of each media item having an identifier recorded in the memory **106** and outputs to the user device **110** a recommendation of the media item that corresponds to the highest average media item rating.

Alternatively, the processor **107** computes the average media item rating of each media item having an identifier recorded in the memory **106** and then adds weighting factors to the average media item ratings in proportion to their frequency of occurrence across the iterations. The processor **107** then outputs to the user device **110** a recommendation of the media item that has a media item rating having the highest weighted average media item rating.

In another aspect, the processor **107** computes the average media item rating of each media item having an identifier recorded in the memory **106** and then adds weighting factors to the average media item ratings in proportion to their distance, in recommendation depth, from the target user **201***a*. The processor **107** then outputs to the user device **110** a recommendation of the media item that has a media item rating having the highest weighted average media item rating.

In some embodiments, each user profile also includes user attributes, such as user age, user sex, user country, user region, user hometown, and/or the like. In this way, the processor **107** can weight item ratings as more relevant for a target user. For example, in one embodiment, each media item profile also includes a user age, and the processor **107** adds weighting factors to the rankings in proportion to the difference in age between the user and the target user **201***a*. In this way, media item recommendations are provided to the target user **201***a* by users who are close in age to the target user **201***a*.

In other embodiments, the user profile also includes rating data, such as a date that each media item was rated, a quantity of media items that have been rated by each user, etc. In this way, the processor **107** can deem more recent media item ratings as more relevant than older media item ratings by, e.g., adding a weight to each media item rating that is proportional to how recent the media item rating is. In particular, in one embodiment, the user profile also includes a date of ranking for each ranking, and the processor **107** adds weighting factors to the rankings in proportion to how recent the ranking is. In this way, older media item ratings, which may be less relevant to the target user **201***a*, are less likely to be relied upon for media item recommendations. The target user **201***a* is provided with media item recommendations of media items that have been more recently rated, and thus likely are more relevant to the preferences of the target user **201***a*.

V. Content-Based Recommendations

A. Overview

In general, the processor **107** provides content-based recommendations by identifying media items having media item attributes similar to the media item attribute preferences of a target user. If the target user indicates a preference for a particular media item attribute, then the processor **107** recommends media items having a high media item attribute strength for that particular media item attribute, e.g., media items that are strongly characterized by that attribute.

B. Item-Attribute Network

FIG. **4** is an item-attribute diagram illustrating information stored in an item-attribute database, such as the item-attribute database **104**. As described above with respect to FIG. **1**, the item-attribute database **104** includes media item profiles for each media item, with each media item profile having a corresponding unique media item identifier. An example of such a media item profile is shown below in Table 2.

TABLE 2

Media Item ID 1	
Media Item Attribute ID 1	Media Item Rating Attribute Strength 1
Media Item Attribute ID 2	Media Item Rating Attribute Strength 2
Media Item Attribute ID 3	Media Item Rating Attribute Strength 3

Each media item profile associates a media item identifier of the corresponding media item with all of the corresponding media item attributes, as well as the media item attribute strength assigned to each media item attribute. These associations are illustrated in the item-attribute diagram **400** by links that connect media item identifiers **402***a*, **402***b*, **402***c*, **402***d*, **402***e*, **402***f*, **402***g* (collectively **402**) to media item attribute identifiers **401***a*, **401***b*, **401***c*, **401***d* (collectively **401**).

As described in further detail below with respect to FIG. **5**, the solid-lined links in the item-attribute diagram **400** represent links to media item identifiers and media item attribute identifiers selected by the processor **107** during the implementation of procedure **500**. The long-dashed links in the item-attribute diagram **400** represent links to media item identifiers and media item attribute identifiers retrieved, but not selected, by the processor **107** during the implementation of procedure **500**. The short-dashed links in the item-attribute diagram **400** represent links to media item identifiers and media item attribute identifiers that have not been retrieved by the processor **107** during the implementation of procedure **500**.

Adjacent to the links in the item-attribute diagram **400** are numbers that represent the media item attribute strengths **403***a*, **403***b*, **403***c*, **403***d*, **403***e*, **403***f*, **403***g*, **403***h*, **403***i*, **403***j*, **403***k* (collectively **403**). The media item attribute strengths

403 illustrated in the item-attribute diagram **400** include degrees of randomization, as described in further detail above with respect to block **302** of FIG. **3**.

As described above in connection with FIG. **1**, each media item attribute denotes a characteristic of the media item and corresponds to a media item attribute category. Examples of media item attribute categories and attributes for music include cognitive attributes (e.g., simplicity, storytelling quality, melodic emphasis, vocal emphasis, speech like quality, strong beat, good groove, fast pace), emotional attributes (e.g., intensity, upbeatness, aggressiveness, relaxing, mellowness, sadness, romance, broken heart), aesthetic attributes (e.g., smooth vocals, soulful vocals, high vocals, sexy vocals, powerful vocals, great vocals), social behavioral attributes (e.g., easy listening, wild dance party, slow dancing, workout, shopping mall), genre attributes (e.g., alternative, blues, country, electronic/dance, folk, gospel, jazz, Latin, new age, R&B/soul, rap/hip hop, reggae, rock), sub-genre attributes (e.g., blues, gospel, motown, stax/memphis, philly, doo-wop, funk, disco, old school, blue-eyed soul, adult contemporary, quiet storm, crossover, dance/techno, electro/synth, new jack swing, retro/alternative, hip hop, rap), instrumental/vocal attributes (e.g., instrumental, vocal, female vocalist, male vocalist), backup vocal attributes (e.g., female vocalist, male vocalist), instrument attributes (e.g., most important instrument, second most important instrument), etc.

Examples of media item attribute categories and media item attributes for movies include genre (e.g., action, animation, children and family, classics, comedy, documentary, drama, faith and spirituality, foreign, high-definition, horror, independent, musicals, romance, science fiction, television, thrillers), release date (e.g., within past six months, within past year, 1980s), etc.

Other media item attribute categories and media item attributes are contemplated and are within the scope of the embodiments described herein.

C. Content-Based Recommendation Process

FIG. **5** is a flowchart diagram illustrating an exemplary procedure **500** for providing a media item recommendation by using an item-attribute diagram, such as the item-attribute diagram **400**. In general, the processor **107** implements the procedure **500** to provide content-based recommendations by identifying media item recommendations based on the associations between media item attributes of multiple media items.

Referring to FIGS. **1**, **4**, and **5**, the procedure **500** begins with a target media item attribute **401***a* determined to be preferred by a target user (not shown). In one embodiment, the target media item attribute is selected by the target user via the user device **110** and input into the recommendation device **101** over the network **109**. Alternatively, the target media item attribute **401***a* can be selected at random, or selected based on a recorded history of the media items preferred by the target user. In yet another embodiment, the target media item attribute(s) can be selected as the attribute(s) linked to a media item the target user is interested in.

Users and/or professional rating personnel input media item attribute strengths for media items via the user device **110** over the network **109**. In one embodiment, the media item attribute strengths are selected on a scale of real-valued numbers or integers, such as a scale from one (denoting that the media item is not characterized by the media item attribute at all) to five (denoting that the media item is characterized by the media item attribute very much). In yet another aspect, the media item attribute strengths **403***a*, **403***b*, **403***c*, **403***d*, **403***e*, **403***f*, **403***g*, **403***h*, **403***i*, **403***j*, **403***k* (collectively **403**) depicted in FIG. **4** are derived from averages of the media item attribute strengths that have been input on a scale of one to five by multiple users for each media item-attribute pair.

At block **501**, the processor **107** retrieves identifiers of all the media items **402***a*, **402***b*, **402***c* that have a nonzero media item attribute strength **403***a*, **403***b*, **403***c* for the target media item attribute **401***a*.

At block **502**, the processor **107** randomizes each of the media item attribute strengths **403***a* through **403***c*, as discussed above in further detail with respect to block **302** of FIG. **3**. The example media item ratings **403** shown in FIG. **4** were selected by users from a scale of one to five and include degrees of randomization (not shown) ranging from zero to two. Thus, the randomized media item ratings **403** of FIG. **4** range from one to seven.

At block **503**, the processor **107** selects an identifier of a media item according to predetermined selection criteria and outputs a recommendation of the media item to the user device **110** over the network **109**. For example, if the highest media item attribute strength is used as the predetermined selection criteria, then the processor **107** selects an identifier of the media item **402***a* that corresponds to the highest of the randomized media item attribute strengths **403***a*, which is six in this case. In this way, the processor **107** identifies the media item **402***a* that is most strongly characterized by the target media item attribute **401***a*.

Alternatively, if the target media item attribute **401***a* was selected as being a media item attribute of a target media item (not shown), then the predetermined selection criteria may command the processor **107** to select an identifier of the media item having a media item attribute strength that is closest in value to the media item attribute strength of the target media item attribute **401***a* for the target media item. In this way, the processor **107** identifies the media item that is most similar to the target media item, in terms of the media item attribute strength of the target media item attribute **401***a*.

Block **504** represents multiple distinct embodiments. In one embodiment, after the processor **107** outputs to the user device **110** over the network **109** a recommendation of the media item corresponding to the identifier selected at block **503**, the procedure **500** ends.

In another embodiment, blocks **501**, **502**, **503** of the procedure **500** are repeated to output to the user device **110** an additional media item recommendation according to the same target media item attribute **401***a*. In this case, at each iteration of the procedures of blocks **501** through **503**, the processor **107** excludes the previously recommended media items from the item-attribute diagram **400** to avoid redundant recommendations.

In yet a further embodiment, the procedure **500** proceeds to block **505** to provide a recommendation of a media item according to a media item attribute that is distinct from the target media item attribute **401***a*. This procedure is sometimes also referred to as media item attribute-hopping. At block **505**, the processor **107** retrieves identifiers of all the other media item attributes (excluding the target media item attribute **401***a*) and media item attribute strengths that correspond to the media item selected at block **503**. For example, if the media item identifier **402***a* was selected at block **503** then the processor **107** retrieves all the identifiers of the media item attributes **401***b* and **401***c* and the media item attribute strengths **403***d* and **403***e* that correspond to the selected media item **402***a*.

At block **506**, the processor **107** selects, for the media item **402***a* selected at block **503**, an identifier of a media item attribute according to predetermined selection criteria. For example, if the highest media item attribute strength is used as the predetermined selection criteria, then the processor **107**

selects an identifier of the media item attribute **401***b* that corresponds to the highest of the randomized media item attribute strengths **403***d*, which is six in this case. In this way, the processor **107** identifies the most distinguishing media item attribute **401***b* of the media item **402***a*.

Alternatively, if the target media item attribute **401***a* was selected as being a media item attribute of a target media item (not shown), then the predetermined selection criteria may command the processor **107** to select, at block **506**, an identifier of the media item attribute having a media item attribute strength that is closest in value to the media item attribute strength of that media item attribute for the target media item. In this way, the processor **107** identifies the media item attribute for which the media item **402***a* selected at block **503** and the target media item have the most similar media item attribute strengths.

In another embodiment, at block **506**, the predetermined selection criteria commands the processor **107** to select a media item attribute identifier in the same media item attribute category as the target media item attribute **401***a*. For example, if the target media item attribute category is genre and the target media item attribute **401***a* is rock, then the processor **107** can select at block **506** another media item attribute identifier within the genre category, such as southern rock.

In another aspect, at block **506**, the predetermined selection criteria command the processor **107** to randomly select a media item attribute identifier. In this way, the processor **107** increases the variety of recommendations and promotes the discovery of new media items.

At block **507**, the processor **107** retrieves all the identifiers of media items that have a nonzero media item attribute strength for the media item attribute that was selected at block **506**.

At block **508**, the processor **107** randomizes, as described above with respect to block **302** of FIG. **3**, each of the media item attribute strengths corresponding to the media item identifiers that were retrieved at block **507**.

At block **509**, the processor **107** selects an identifier of a media item according to predetermined selection criteria and outputs a recommendation of the media item to the user device **110** over the network **109**. For example, if the highest media item attribute strength is used as the predetermined selection criteria, then the processor **107** selects an identifier of the media item **402***e* that corresponds to the highest of the randomized media item attribute strengths **403***h*, which is six in this example. In this way, the processor **107** identifies the media item **402***e* that is most strongly characterized by the previous media item attribute **401***b*.

Alternatively, the predetermined selection criteria may command the processor **107** to select an identifier of the media item having a media item attribute strength of the media item attribute **401***b* that is closest in value to the media item attribute strength **403***d* of the media item attribute **401***b* for the previous media item **402***a*. In this way, the processor **107** identifies the media item **402***e* that is most similar to the previous media item **402***a*, in terms of the media item attribute strength of the media item attribute **401***b* under consideration.

Block **510** represents multiple distinct embodiments. In one embodiment, after the processor **107** outputs to the user device **110** over the network **109** a recommendation of the media item corresponding to the identifier selected at block **509**, the procedure **500** is complete. In another embodiment, blocks **505**, **506**, **507**, **508**, **509** of the procedure **500** are repeated to output an additional media item recommendation by using an additional media item attribute.

In yet another aspect, the additional iterations of the procedure **500** are performed for the target media item attribute **401***a* to analyze and identify additional potential media item recommendations. In this case, the processor **107** records in the memory **106** the media item identifiers selected at blocks **503** and/or **509**, as the case may be, across multiple iterations of the procedure **500** and then determines which of the corresponding media items to recommend to the user device **110**.

In some embodiments, the processor **107** outputs to the user device **110** a recommendation of the media item having an identifier recorded in the memory **106** that has the highest frequency of occurrences across the iterations.

Alternatively, the processor **107** computes the average media item attribute strength of each media item attribute having an identifier recorded in the memory **106** and outputs to the user device **110** a recommendation of the media item based on the media item attribute that has the highest average media item attribute strength.

In yet another aspect, the processor **107** computes the average media item attribute strength of each media item attribute having an identifier recorded in the memory **106** and then adds weighting factors to the average media item attribute strengths in proportion to their frequency of occurrence across the iterations. The processor **107** outputs to the user device **110** a recommendation of the media item having a media item attribute strength equal to the weighted average media item attribute strength.

VI. Exemplary Computer Readable Medium Implementation

The example embodiments described above such as, for example, the system **100**, the diagrams **200**, **400**, the procedures **300**, **500**, or any part(s) or function(s) thereof, may be implemented by using hardware, software or a combination thereof and may be implemented in one or more computer systems or other processing systems. However, the manipulations performed by these example embodiments were often referred to in terms, such as entering, which are commonly associated with mental operations performed by a human operator. No such capability of a human operator is necessary in any of the operations described herein. For example, the recommendation device **101** may automatically recommend programs without receiving a user's input through the user device **110**. In other words, the operations may be completely implemented with machine operations. Useful machines for performing the operation of the example embodiments presented herein include general purpose digital computers or similar devices.

FIG. **6** is a high-level block diagram of a general and/or special purpose computer system **600**, in accordance with some embodiments. The computer system **600** may be, for example, a user device, a user computer, a client computer and/or a server computer, among other things.

The computer system **600** preferably includes without limitation a processor device **610**, a main memory **625**, and an interconnect bus **605**. The processor device **610** may include without limitation a single microprocessor, or may include a plurality of microprocessors for configuring the computer system **600** as a multi-processor system. The main memory **625** stores, among other things, instructions and/or data for execution by the processor device **610**. If the system is partially implemented in software, the main memory **625** stores the executable code when in operation. The main memory **625** may include banks of dynamic random access memory (DRAM), as well as cache memory.

The computer system **600** may further include a mass storage device **630**, peripheral device(s) **640**, portable storage medium device(s) **650**, input control device(s) **680**, a graphics subsystem **660**, and/or an output display **670**. For explanatory purposes, all components in the computer system **600** are shown in FIG. **6** as being coupled via the bus **605**. However, the computer system **600** is not so limited. Devices of the computer system **600** may be coupled through one or more data transport means. For example, the processor device **610** and/or the main memory **625** may be coupled via a local microprocessor bus. The mass storage device **630**, peripheral device(s) **640**, portable storage medium device(s) **650**, and/or graphics subsystem **660** may be coupled via one or more input/output (I/O) buses. The mass storage device **630** is preferably a nonvolatile storage device for storing data and/or instructions for use by the processor device **610**. The mass storage device **630** may be implemented, for example, with a magnetic disk drive or an optical disk drive. In a software embodiment, the mass storage device **630** is preferably configured for loading contents of the mass storage device **630** into the main memory **625**.

The portable storage medium device **650** operates in conjunction with a nonvolatile portable storage medium, such as, for example, a compact disc read only memory (CD-ROM), to input and output data and code to and from the computer system **600**. In some embodiments, the software for storing an internal identifier in metadata may be stored on a portable storage medium, and may be inputted into the computer system **600** via the portable storage medium device **650**. The peripheral device(s) **640** may include any type of computer support device, such as, for example, an input/output (I/O) interface configured to add additional functionality to the computer system **600**. For example, the peripheral device(s) **640** may include a network interface card for interfacing the computer system **600** with a network **620**.

The input control device(s) **680** provide a portion of the user interface for a user of the computer system **600**. The input control device(s) **680** may include a keypad and/or a cursor control device. The keypad may be configured for inputting alphanumeric and/or other key information. The cursor control device may include, for example, a mouse, a trackball, a stylus, and/or cursor direction keys. In order to display textual and graphical information, the computer system **600** preferably includes the graphics subsystem **660** and the output display **670**. The output display **670** may include a cathode ray tube (CRT) display and/or a liquid crystal display (LCD). The graphics subsystem **660** receives textual and graphical information, and processes the information for output to the output display **670**.

Each component of the computer system **600** may represent a broad category of a computer component of a general and/or special purpose computer. Components of the computer system **600** are not limited to the specific implementations provided here.

Portions of the invention may be conveniently implemented by using a conventional general purpose computer, a specialized digital computer and/or a microprocessor programmed according to the teachings of the present disclosure, as will be apparent to those skilled in the computer art. Appropriate software coding may readily be prepared by skilled programmers based on the teachings of the present disclosure.

Some embodiments may also be implemented by the preparation of application-specific integrated circuits, field programmable gate arrays, or by interconnecting an appropriate network of conventional component circuits.

Some embodiments include a computer program product. The computer program product may be a storage medium or media having instructions stored thereon or therein which can be used to control, or cause, a computer to perform any of the processes of the invention. The storage medium may include without limitation a floppy disk, a mini disk, an optical disc, a Blu-ray Disc, a DVD, a CD-ROM, a micro-drive, a magneto-optical disk, a ROM, a RAM, an EPROM, an EEPROM, a DRAM, a VRAM, a flash memory, a flash card, a magnetic card, an optical card, nanosystems, a molecular memory integrated circuit, a RAID, remote data storage/archive/warehousing, and/or any other type of device suitable for storing instructions and/or data.

Stored on any one of the computer readable medium or media, some implementations include software for controlling both the hardware of the general and/or special computer or microprocessor, and for enabling the computer or microprocessor to interact with a human user or other mechanism utilizing the results of the invention. Such software may include without limitation device drivers, operating systems, and user applications. Ultimately, such computer readable media further includes software for performing aspects of the invention, as described above.

Included in the programming and/or software of the general and/or special purpose computer or microprocessor are software modules for implementing the processes described above.

While various example embodiments of the present invention have been described above, it should be understood that they have been presented by way of example, and not limitation. It will be apparent to persons skilled in the relevant art(s) that various changes in form and detail can be made therein. Thus, the present invention should not be limited by any of the above described example embodiments, but should be defined only in accordance with the following claims and their equivalents.

In addition, it should be understood that the figures are presented for example purposes only. The architecture of the example embodiments presented herein is sufficiently flexible and configurable, such that it may be utilized and navigated in ways other than that shown in the accompanying figures.

Further, the purpose of the Abstract is to enable the U.S. Patent and Trademark Office and the public generally, and especially the scientists, engineers and practitioners in the art who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection the nature and essence of the technical disclosure of the application. The Abstract is not intended to be limiting as to the scope of the example embodiments presented herein in any way. It is also to be understood that the procedures recited in the claims need not be performed in the order presented.

The invention claimed is:

1. A method for providing a recommendation of a media item to a target user, the method comprising steps of:

retrieving, from a database, an identifier of a first media item rated by a target user;

retrieving, from the database, user identifiers of users having provided media item ratings for the first media item and the media item ratings provided by the users, correspondingly;

randomizing each of the media item ratings using a computer processor, resulting in randomized media item ratings, wherein randomizing includes applying a random number to each of the media item ratings by performing an arithmetical calculation;

selecting, from the user identifiers, a user identifier corresponding to a highest value of the randomized media item ratings;

retrieving, from the database, additional media item ratings associated with the selected user identifier;

randomizing each of the additional media item ratings using a computer processor, resulting in additional randomized media item ratings, wherein randomizing includes applying a random number to each of the additional media item ratings by performing an arithmetical calculation;

selecting an identifier of a recommended media item corresponding to a highest value of the randomized media item ratings and the additional randomized media item ratings; and

transmitting, to a user device over a network, metadata associated with the recommended media item.

2. The method of claim **1**, further comprising:

identifying a plurality of media item recommendations for the target user, wherein the plurality of media item recommendations correspond to a plurality of media items;

computing, for each of the plurality of media items, a total number of occurrences of the media item within the plurality of media items; and

transmitting, to the user device, a media item recommendation of one of the plurality of media items corresponding to a highest value of the total numbers of occurrences.

3. The method of claim **1**, further comprising:

receiving, from the user device over the network, at least one of a media item rating and a request for a media item recommendation.

4. The method of claim **1**, further comprising:

identifying a plurality of recommended media items for the target user by performing a plurality of iterations of at least one of the steps of claim **1**;

selecting an identifier of one of the plurality of recommended media items; and

transmitting, to the user device, metadata associated with the selected one of the plurality of recommended media items,

wherein the selected user identifiers and media item identifiers are eligible to be selected repeatedly within each iteration.

5. A system for providing a recommendation of a media item to a target user, the system, comprising:

at least one processor configured to:

retrieve, from a database, an identifier of a first media item rated by a target user;

retrieve, from the database, user identifiers of users having provided media item ratings for the first media item and the media item ratings provided by the users, correspondingly;

randomize each of the media item ratings, resulting in randomized media item ratings, wherein randomizing includes applying a random number to each of the media item ratings by performing an arithmetical calculation;

select, from the user identifiers, a user identifier corresponding to a highest value of the randomized media item ratings;

retrieve, from the database, additional media item ratings associated with the selected user identifier;

randomize each of the additional media item ratings, resulting in additional randomized media item ratings, wherein randomizing includes applying a random number to each of the additional media item ratings by performing an arithmetical calculation;

select an identifier of a recommended media item corresponding to a highest value of the randomized media item ratings and the additional randomized media item ratings; and

transmit, to a user device over a network, metadata associated with the recommended media item.

6. The system of claim **5**, wherein the at least one processor is further operable to:

identify a plurality of media item recommendations for the target user, the plurality of media item recommendations corresponding to a plurality of media items;

compute, for each of the plurality of media items, a total number of occurrences of the media item within the plurality of media items; and

transmit, to the user device, a media item recommendation of one of the plurality of media items corresponding to a highest value of the total numbers of occurrences.

7. The system of claim **5**, wherein the at least one processor is further operable to:

receive, from the user device over the network, at least one of a media item rating and a request for a media item recommendation.

8. The system of claim **5**, wherein the at least one processor is further operable to:

identify a plurality of recommended media items for the target user by performing a plurality of iterations of at least one of the steps of claim **5**;

select an identifier of one of the plurality of recommended media items; and

transmit, to the user device, metadata associated with the selected one of the plurality of recommended media items,

wherein the selected user identifiers and media item identifiers are eligible to be selected repeatedly within each iteration.

9. A non-transitory computer-readable medium having stored thereon sequences of instructions, the sequences of instructions including instructions, which, when executed by a processor, cause the processor to perform:

retrieving, from a database, an identifier of a first media item rated by a target user;

retrieving, from the database, user identifiers of users having provided media item ratings for the first media item and the media item ratings provided by the users, correspondingly;

randomizing each of the media item ratings, resulting in randomized media item ratings, wherein randomizing includes applying a random number to each of the media item ratings by performing an arithmetical calculation;

selecting, from the user identifiers, a user identifier corresponding to a highest value of the randomized media item ratings;

retrieving, from the database, additional media item ratings associated with the selected user identifier;

randomizing each of the additional media item ratings, resulting in additional randomized media item ratings, wherein randomizing includes applying a random number to each of the additional media item ratings by performing an arithmetical calculation;

selecting an identifier of a recommended media item corresponding to a highest value of the randomized media item ratings and the additional randomized media item ratings; and

transmitting, to a user device over a network, metadata associated with the recommended media item.

10. The computer-readable medium according to claim 9, further having stored thereon a sequence of instructions, which, when executed by the processor, cause the processor to perform:

identifying a plurality of media item recommendations for the target user, wherein the plurality of media item recommendations correspond to a plurality of media items;

computing, for each of the plurality of media items, a total number of occurrences of the media item within the plurality of media items; and

transmitting, to the user device, a media item recommendation of one of the plurality of media items corresponding to a highest value of the total numbers of occurrences.

11. The computer-readable medium according to claim 9, further having stored thereon a sequence of instructions, which, when executed by the processor, cause the processor to perform:

receiving, from the user device over the network, at least one of a media item rating and a request for a media item recommendation.

12. The computer-readable medium according to claim 9, further having stored thereon a sequence of instructions, which, when executed by the processor, cause the processor to perform:

identifying a plurality of recommended media items for the target user by performing a plurality of iterations of at least one of the steps of claim 9;

selecting an identifier of one of the plurality of recommended media items; and

transmitting, to the user device, metadata associated with the selected one of the plurality of recommended media items,

wherein the selected user identifiers and media item identifiers are eligible to be selected repeatedly within each iteration.

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